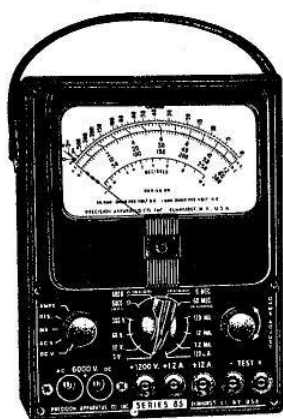


OPERATING INSTRUCTIONS

FOR

PRECISION

SERIES 85



HIGH SENSITIVITY MULTI-RANGE TEST SET

20,000 OHMS PER VOLT D.C.



PRECISION APPARATUS COMPANY, INC.

92-27 HORACE HARDING BLVD. • ELMHURST, NEW YORK

Export Division: 458 BROADWAY, NEW YORK CITY, U. S. A. • Cables: MORHANEX

INSTRUCTIONS FOR OPERATING THE PRECISION
SERIES 85 HIGH SENSITIVITY MULTI-RANGE TEST SET

20,000 OHMS PER VOLT D.C. - 1000 OHMS PER VOLT A.C.
34 Ranges to 6000 volts, 60 megohms, 12 amperes, +77 DB

In the design of the Series 85 rotary selective multi-range test set, Precision engineers have embodied advanced circuit features, making available all A.C. and D.C. voltages (except 1200 volts and 6000 volts), resistance, output indications, decibel and D.C. current measurements (except 1.2 Amps. and 12 Amps.), at only one set of polarized tip jacks through the use of a master MULTI-RANGE SELECTOR.

This rotary RANGE SELECTOR permits speedy range change without the necessity of removing and re-inserting test leads, as would be required if numerous tip jacks were to be employed.

As a precaution against meter overloads, two polarized tip jacks provide for two distinct D.C. current ranges; namely, 1.2 AMPS and 12 AMPS. Three specially isolated tip jacks provide for obtaining high voltage measurements (above 300 to 6000 volts). These ranges are used in conjunction with the RANGE SELECTOR as is outlined in "Operating Instructions".

The Series 85 test set provides the following functions and ranges:

1. SIX A.C. VOLTAGE RANGES at 1000 ohms per volt:
0-3; 0-12; 0-60; 0-300; 0-1200; 0-6000 volts.
2. SIX D.C. VOLTAGE RANGES at 20,000 ohms per volt:
0-3; 0-12; 0-60; 0-300; 0-1200; 0-6000 volts.
3. SIX D.C. CURRENT RANGES:
0-120 microamps; 0-1.2; 0-12; 0-120 MA; 0-1.2; 0-12 AMPERES.
4. FOUR RESISTANCE RANGES:
0-6000 ohms (35 ohms at center scale)
0-600,000 ohms (3500 ohms at center scale)
0-6 Megohm (35,000 ohms at center scale)
0-60 Megohms (350,000 ohms at center scale)
5. SIX DECIBEL RANGES FROM -12 to +77 DB.
6. SIX OUTPUT RANGES:
0-3; 0-12; 0-60; 0-300; 0-1200; 0-6000 volts.
7. D.C. CURRENT MEASUREMENTS OF LEAKAGE IN ELECTROLYTIC CONDENSERS.
8. QUALITATIVE PAPER CONDENSER TESTS.

OPERATING INSTRUCTIONS

Before attempting to operate the instrument, particular note should be taken of the set of tip jacks incorporated at the lower edge of the instrument panel.

The right hand pair of tip jacks marked "TEST" are used for all resistance, decibel, output indications and current measurements (except 1.2 and 12 AMPS.) and for voltage measurements only up to 300 volts.

The left hand set of three specially isolated high voltage tip jacks marked "+1200V" and "+6000V AC-DC" are employed for voltage measurements above 300 to 6000 volts. The minus (-) "TEST" tip jack is used as the common minus (-) tip jack for the +1200V or +6000V ranges.

THE ROTARY RANGE SELECTOR SHOULD ALWAYS FIRST BE SET TO THE 300V POSITION WHEN USING EITHER OF THE EXTRA HIGH VOLTAGE RANGES.

CAUTION: When employing the 6000V. range, for measurements in high voltage circuits, extreme care must be observed in the manner of handling test prods, tip jacks and high voltage circuits under analysis. We recommend, for this purpose, only use of "PRECISION" extra-high voltage super-flex test leads, (Part #228) which have been specifically designed for full safety of operation up to 6000 volts D.C. and 60 cycles A.C.

A.C. VOLTAGE MEASUREMENTS.

Set left hand Function Selector switch to the "AC V." position for all A.C. voltage measurements. Select suitable voltage range on the RANGE SELECTOR. Read A.C. voltage measurements on RED A.C. CORRECTION SCALE as follows:

- 0-3 volts read on 300 scale, divide by 100
- 0-12 volts read directly
- 0-60 volts read directly
- 0-300 volts read directly
- 0-1200 volts read on 12 scale, multiply by 100
- * 0-6000 volts read on 60 scale, multiply by 100

* For 6000 volts A.C. range use the A.C. 6000V. jack at extreme left side of panel!

D.C. VOLTAGE MEASUREMENTS.

Set Function Selector switch to the "D.C.V." position for all D.C. Voltage measurements. Select suitable voltage range on the RANGE SELECTOR. Read D.C. Voltage measurements on D.C. meter scale as follows:

0-3 volts read on 300 scale, divide by 100
 0-12 volts read directly
 0-60 volts read directly
 0-300 volts read directly
 0-1200 volts read on 12 scale, multiply by 100
 * 0-6000 volts read on 60 scale, multiply by 100

* For 6000volts D.C. range use the D.C. 6000V. jack, second from left side of panel!

All voltage measurements are made with test leads applied across load. Observe proper polarity at tip jacks.

IMPORTANT PRECAUTIONS When Testing High Voltage Circuits

NEVER attempt adjustment or test of any circuits (such as television receivers) wherein exceedingly dangerously high voltages are present unless a complete circuit diagram is available, to identify the location of all high potential terminals. Always employ well insulated test leads, such as the Precision Extra-High Voltage Super-Flex test leads, Part #228. Available from distributors and factory.

* * * * *

Make sure hands and shoes are DRY when performing tests wherein high voltage are involved.

* * * * *

D.C. CURRENT MEASUREMENTS.

It is important to note that the +1.2 and +12 AMPERE ranges are only obtainable when positive test lead is inserted into their respective tip jacks located on instrument panel, with FUNCTION SELECTOR SET TO THE "AMPS" POSITION. The negative test lead is inserted into the "-TEST" jack.

For Milliampere ranges, set Function Selector switch to the "MA." position. Select proper current range on the RANGE SELECTOR. Read D.C. current measurements on D.C. meter scale as follows:

0-120 μ amps. read on 12 scale, multiply by 10
 0-1.2 MA read on 12 scale, divide by 10
 0-12 MA read directly
 0-120 MA read on 12 scale, multiply by 10
 0-1.2 AMPS read on 12 scale, divide by 10
 0-12 AMPS read directly

NOTE: When using the 12 AMPERE D.C. range, never remove test leads from pin jacks while current is flowing through the circuit. Failure to observe this may result in arcing at the pin jacks, and though it would not necessarily injure the meter, the jack would gradually char.

All current measurements are made with test leads in series with load. Observe proper polarity at tip jacks.

CAUTION: When voltage or current of unknown value is to be measured, it is advisable to employ the highest range first. If meter indication is slight, then select next lower range, etc. Adhere closely to the above in order to prevent slamming of meter pointer and meter overloading.

RESISTANCE MEASUREMENTS.

Set Function Selector switch to the "RES." position for all resistance measurements.

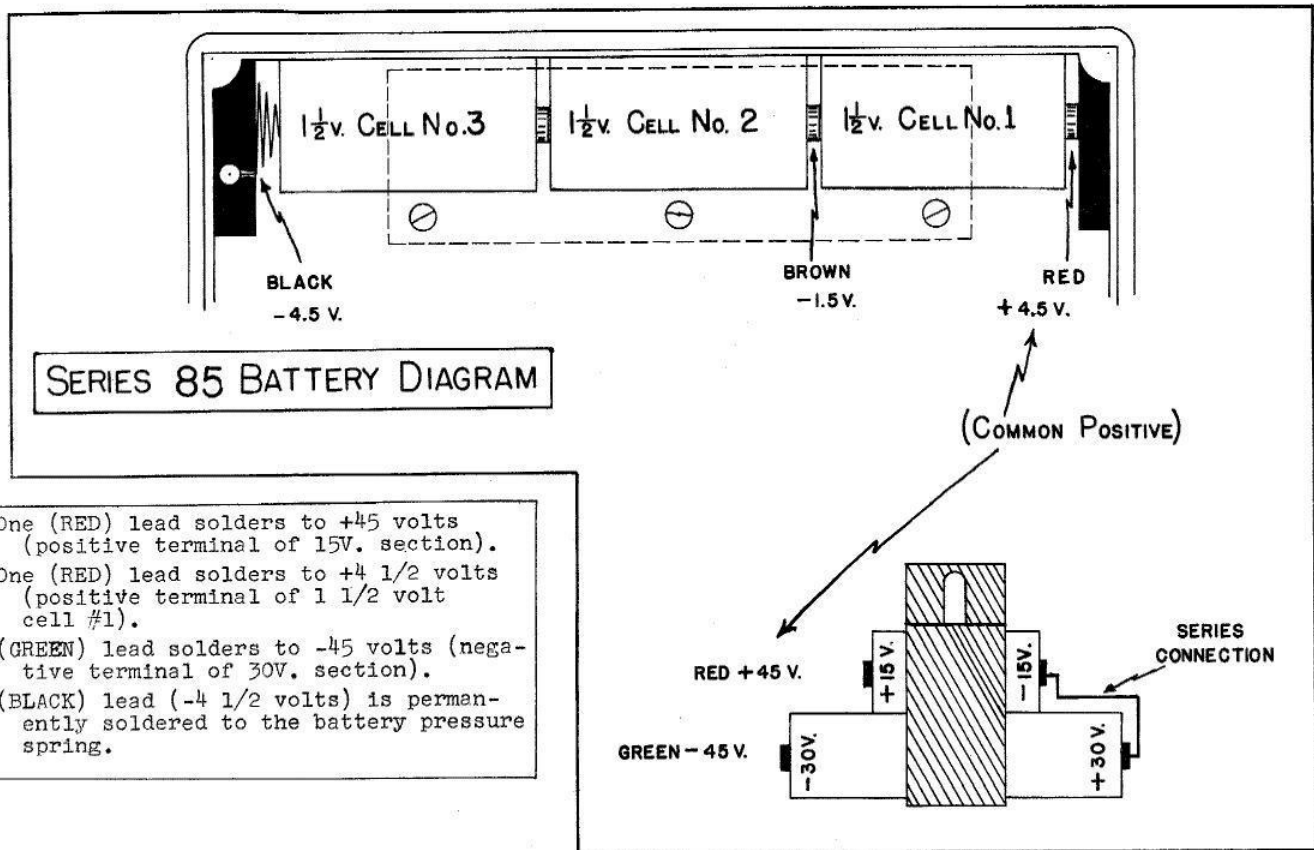
Ohmmeter adjustments for the resistance ranges are as follows:

Set RANGE SELECTOR to the desired ohmmeter range, and with "TEST" leads SHORTED, rotate "OHMS ADJUST" control to obtain full scale deflection. Then proceed with measurements.

Resistance measurements are read on the upper 0-6000 ohms scale as follows:

0-6000 ohms range read directly.
 0-600K ohms range, multiply reading by 100, (Rx100)
 0-6 Megohm range, multiply reading by 1000, (Rx1000)
 0-60 Megohm range, multiply reading by 10,000, (Rx10,000)

CAUTION: Always first disengage one end of resistance from the circuit before making resistance measurements, or else an indication of the true resistance value may not be obtained due to the possibility of the circuit therein involved effectively shunting the resistance to be measured, thus reducing the true reading by an amount proportionate to the resistance of the included shunt network.



OUTPUT METER INDICATIONS.

The A.C. voltage measurements at a high sensitivity of 1000 ohms per volt makes this instrument ideally suitable for use as an output meter.

There are two methods that can be used for obtaining output meter indications as listed below:

In the first method, make connections from the voice coil of speaker or secondary of output transformer to "TEST" tip jacks. In the event that easy access to the voice coil or secondary of transformer cannot be had, then refer to method outlined below.

In the second method, make connections from plate of output tube and ground or chassis of radio receiver to "TEST" tip jacks with a .25 mfd. condenser in series with one of the leads in order to block the D.C. component. The voltage rating of this condenser should be comparable to twice the D.C. voltage appearing at the points across which the output measurements are taken.

PROCEDURE:

With the use of either method noted above, set Function Selector switch to the "AC V." position and rotate RANGE SELECTOR to highest voltage range. An output meter indication will be had when signal generator and radio receiver is put into operation. If the meter indication is slight, then use the next lower A.C. voltage range, etc.

Any gain or loss by reason of balancing or trimming will be accordingly noted by corresponding meter pointer deflection.

NOTE: The output meter can also be used to great advantage for obtaining comparisons in tube performance by noting the difference in meter indications when any or all of the tubes are substituted in the radio receiver under test.

DECIBEL METER.

THE INSTRUMENT INCORPORATES A DIRECT READING AND CALIBRATED DECIBEL SCALE ENABLING READINGS FROM -12 TO +77 DB IN SIX RANGES.

THE INITIAL SCALE READING -12 TO +11 DB IS BASED UPON A ZERO LEVEL OF 1 MILLIWATT OR .775 VOLTS ACROSS A 600 OHM LOAD, 600 OHMS BEING COMMONLY EMPLOYED IN AUDIO WORK. THE MOST FREQUENT USE OF A DECIBEL METER IS THAT OF A POWER LEVEL INDICATOR ACROSS KNOWN IMPEDANCES. BECAUSE OF CALIBRATION AT ONE DEFINITE IMPEDANCE, CONVERSIONS MUST BE MADE TO THE NEW IMPEDANCE WHEN USED AT OTHER THAN 600 OHMS. SUCH TABLES MAY BE FOUND IN A MULTIPLICITY OF TEXTBOOKS AND TECHNICAL MAGAZINES.

NOTE: REFER TO DECIBEL CONVERSION TABLE, LAST PAGE OF THIS BOOKLET FOR INTERPRETATION OF DECIBEL READINGS IN TERMS OF POWER RATIO, AND VOLTAGE RATIO.

CAUTION MUST BE OBSERVED IN THE USE OF THE DB RANGES THAT THE CIRCUIT ACROSS WHICH THE METER IS PLACED IS ISOLATED FROM ALL D.C., ELSE THE METER AND/OR RECTIFIER MAY BE DAMAGED OR AT LEAST ERRONEOUS READINGS OBTAINED, DEPENDING UPON THE MAGNITUDE OF THE D.C. VOLTAGE.

PROCEDURE:

SET FUNCTION SELECTOR SWITCH TO THE "A.C." POSITION FOR ALL DECIBEL READINGS. SELECT SUITABLE AC RANGE ON RANGE SELECTOR AND READ AS FOLLOWS ON DB SCALE OF METER.

DB RANGE REQUIRED	SET RANGE SELECTOR SWITCH TO	DB READING OBTAINED
-12 DB TO +11 DB	3V. A.C.	READ DB SCALE DIRECTLY
0 DB TO +23 DB	12V. " "	ADD +12 DB TO SCALE READING
+14 DB TO +37 DB	60V. " "	ADD +26 DB TO " "
+28 DB TO +51 DB	300V. " "	ADD +40 DB TO " "
+40 DB TO +63 DB	*1200V. " "	ADD +52 DB TO " "
+54 DB TO +77 DB	*6000V. " "	ADD +66 DB TO " "

*SET RANGE SELECTOR SWITCH TO 300V. POSITION AND USE THE 1200 AND 6000 V. TIP JACK.

CURRENT MEASUREMENTS OF LEAKAGE IN ELECTROLYTIC CONDENSERS.

THE LEAKAGE IN AN ELECTROLYTIC CONDENSER IS MEASURED IN TERMS OF D.C. CURRENT (PER MICROFARAD) FLOWING THROUGH THE CONDENSER WHEN RATED D.C. VOLTAGE IS APPLIED.

ALL ELECTROLYTIC CONDENSERS CONTAIN AN INHERENT CURRENT LEAKAGE. HOWEVER, IF LEAKAGE ABOVE AN ALLOWABLE AMOUNT IS PRESENT, IT CAN THEN BE TERMED AS POOR. AN ALLOWABLE CURRENT LEAKAGE IS DEPENDENT UPON SUCH FACTORS AS AGE AND MANUFACTURERS' SPECIFICATIONS OF A CONDENSER, DESIGN OF POWER UNIT, FILTER SYSTEM AND RECTIFIER TUBE OF THE RADIO RECEIVER IN WHICH THE CONDENSER IS INCORPORATED. IN GENERAL, CONSIDERING AN 8 MFD. CONDENSER THAT HAS BEEN IN USE, (RATED AT 450 VOLTS), THE MAXIMUM ALLOWABLE LEAKAGE IS APPROXIMATELY .5 MA PER MICROFARAD OR 4 MA TOTAL.

THE FOLLOWING WILL SERVE AS A BASIS FOR COMPUTING APPROXIMATE ALLOWABLE LEAKAGES:

- FOR CONDENSERS RATED AT 300 VOLTS OR MORE, LEAKAGE OF APPROXIMATELY .5 MA PER MICROFARAD IS PERMISSIBLE.
- FOR CONDENSERS RATED BETWEEN 100 TO 275 VOLTS, PERMISSIBLE LEAKAGE IS APPROXIMATELY .2 MA PER MICROFARAD.
- FOR CONDENSERS RATED BELOW 100 VOLTS, PERMISSIBLE LEAKAGE IS APPROXIMATELY .1 MA PER MICROFARAD.

CAUTION: WHEN OBTAINING ELECTROLYTIC LEAKAGE MEASUREMENTS, HIGH VOLTAGE IS EMPLOYED. IT IS THEREFORE EXTREMELY IMPORTANT THAT THE FOLLOWING INSTRUCTIONS BE ADHERED TO IMPLICITLY TO PREVENT DAMAGE TO METER.

PROCEDURE:

WITH CONDENSER DISCONNECTED FROM RADIO RECEIVER CIRCUIT, CHECK CONDENSER FOR SHORT WITH OHMMETER USING THE 0-600K OHMS RANGE. POLARITIES MUST BE OBSERVED. THE + POSITIVE "TEST" TIP JACK IS CONNECTED TO OUTSIDE CAN OR NEGATIVE TERMINAL OF CONDENSER AND THE NEGATIVE "TEST" TIP JACK IS CONNECTED TO THE ANODE (POSITIVE) TERMINAL OF CONDENSER. A DECIDED LOW RESISTANCE READING OR CONSTANT FULL SCALE DEFLECTION OF OHMMETER POINTER INDICATES THAT THE CONDENSER IS SHORTED AND SHOULD BE REJECTED WITHOUT FURTHER TESTING.

WHEN AN ELECTROLYTIC INCORPORATED IN A RADIO RECEIVER IS TO BE TESTED, THE NECESSARY RATED VOLTAGE IS AUTOMATICALLY APPLIED AND THE FOLLOWING CONNECTIONS ARE MADE FOR "FORMING" AND MEASURING THE CURRENT LEAKAGE, AFTER BEING (OHMMETER) TESTED FOR SHORT.

- SET FUNCTION SELECTOR SWITCH TO THE "MA." POSITION AND ROTATE RANGE SELECTOR TO THE 120 MA POSITION.
- REMOVE LEAD FROM (POSITIVE) ANODE TERMINAL OF CONDENSER AND CONNECT THIS LEAD TO THE POSITIVE "TEST" TIP JACK WITH A PROPER LIMITING RESISTOR IN SERIES. (WHERE VOLTAGE APPLIED TO CONDENSER IS ABOVE 100 VOLTS, THE LIMITING RESISTOR SHOULD BE APPROXIMATELY 4000 OHMS. WHEN THE APPLIED VOLTAGE IS BELOW 100 VOLTS, THE VALUE OF THE LIMITING RESISTOR SHOULD BE APPROXIMATELY 900 OHMS. THIS LIMITING RESISTOR IS VERY IMPORTANT AND SHOULD NOT BE OMITTED.)

3. Connect the negative "TEST" tip jack to the (positive) anode terminal of condenser. (From the above connections, it can be seen that the "TEST" tip jacks, limiting resistor, condenser terminals and voltage source are in series connection.)
4. After series connections are made, turn on switch of radio set. The meter pointer will now deflect to near full scale and then gradually recede to the zero mark or near zero, after the expiration of about three minutes. THIS PROCEDURE IS KNOWN AS "FORMING" THE CONDENSER.

NOTE: A steady meter pointer indication without receding to or near zero (after forming process) indicates a shorted or leaky electrolytic and should be rejected WITHOUT FURTHER TESTING.

5. After "forming", short out the limiting resistor and read current leakage of condenser under test directly on the 120 MA scale. If meter reading is under 12 MA, set RANGE SELECTOR to the 12 MA position for a better meter indication and read on 12 MA scale, etc. (For computation of permissible condenser leakages, refer to basis noted previously.)

CAUTION: After this test is completed, always first disconnect the negative test lead from circuit before turning off power supply to prevent slamming of meter pointer due to discharge of condenser under test.

To test electrolytic condensers not incorporated in a radio set, an external D.C. power supply is necessary, preferably one that employs various voltage taps suitable for application of the various D.C. voltage condenser ratings. In this case, adhere to the same testing procedure as noted above in paragraphs 1, 4 and 5, but making the following series connections:

- a) Select voltage tap of D.C. power supply approximating rated voltage of condenser to be tested.
- b) Connect positive potential of power supply to the positive "TEST" tip jack with a 4000 ohm limiting resistor in series if applied potential is above 100 volts. If potential is 100 volts or under, use a 900 ohm limiting resistor.
- c) Connect negative potential of power supply to outside can or negative terminal of condenser.
- d) Connect negative "TEST" tip jack to the (positive) anode terminal of condenser.
- e) Refer to paragraphs 1, 4 and 5, for obtaining current leakage measurements.

QUALITATIVE PAPER CONDENSER TESTS.

The insulation resistance or permissible leakages of paper and mica condensers is expressed in megohm-microfarads. A good 1 mfd. condenser will have an insulation of approximately 450 megohms. Furthermore, insulation resistance of paper and mica condensers of similar voltage rating is inversely proportional to its capacity, so that a .1 mfd. condenser will have ten times the insulation resistance of a 1 mfd. condenser or 4500 megohms. It therefore can be readily seen that it would not be practical to use the ohmmeter method for measuring leakages in paper or mica condensers.

In the method described below, a high D.C. potential is applied to the condenser in series with the proper D.C. VOLTS range to determine whether or not it has low insulation resistance or abnormal leakage.

The necessary D.C. potential can be obtained from an external high voltage D.C. power supply or from the power output tube socket of a radio receiver. In the latter instance, the plate prong position of that socket will be the positive high voltage lead and the negative return or ground will be the negative lead. Voltage to be applied to the condenser should be greater than its rated voltage.

PROCEDURE:

1. Measure the D.C. voltage obtainable from D.C. power supply. Then select the proper meter range that would indicate the greatest deflection for the voltage there available.
2. With the power supply OFF, insert the condenser to be tested in series with one of the test leads.
3. Turn ON power supply. An instantaneous deflection due to the charge of the condenser will be indicated on the D.C. meter.
 - a) In the case of a good condenser, the needle pointer will recede to the zero voltage mark.
 - b) If the meter pointer remains above the zero mark, then this indicates that the condenser has abnormal leakage.

- c) If the meter pointer remains at the indicated value of the voltage measurement obtained primarily, then the condenser is "shorted".
- d) If no meter deflection is obtained, then this indicates that the condenser is "open" or that the capacity is too low in value to indicate an instantaneous noticeable meter deflection when charged.

NOTE: After this test is completed, always first disconnect the negative test lead from circuit before turning off power supply to prevent slamming needle pointer due to discharge of condenser under test.

GENERAL INFORMATION

NOTE: A slight overload will damage or change characteristics of the meter rectifier incorporated. Rectifiers are checked carefully before the instrument leaves the factory. It is important to note this fact inasmuch as rectifiers cannot be guaranteed when overloaded.

Instructions and registration-guarantee cards are enclosed with this instrument. Mail the registration card at once. The Precision warranty extends only to duly registered equipment. Always give model and serial number when writing for information relative to this instrument.

SERIES 85 ACCESSORIES INCLUDED:

- 3 - #935 - 1 1/2 volt Eveready or Burgess #1 Batteries
- 1 - #411 - 15 volt Eveready or #U-10-E Burgess Battery
- 1 - #413 - 30 volt Eveready or #U-20-E Burgess Battery
- 1 - Set #227 Super-Flex test leads

NOTE: Replacement parts, batteries, "PRECISION" #227 SUPER FLEX TEST LEADS or #228 EXTRA HIGH VOLTAGE TEST LEADS can be purchased from your PRECISION DISTRIBUTOR, or from the factory upon remittance of money order or stamps. Current prices quoted upon request. C.O.D. parts service has been necessarily discontinued.

* * * * *

PRECISION APPARATUS COMPANY, INC.
92-27 Horace Harding Blvd.,
Elmhurst, L.I., N.Y.

* * * * *

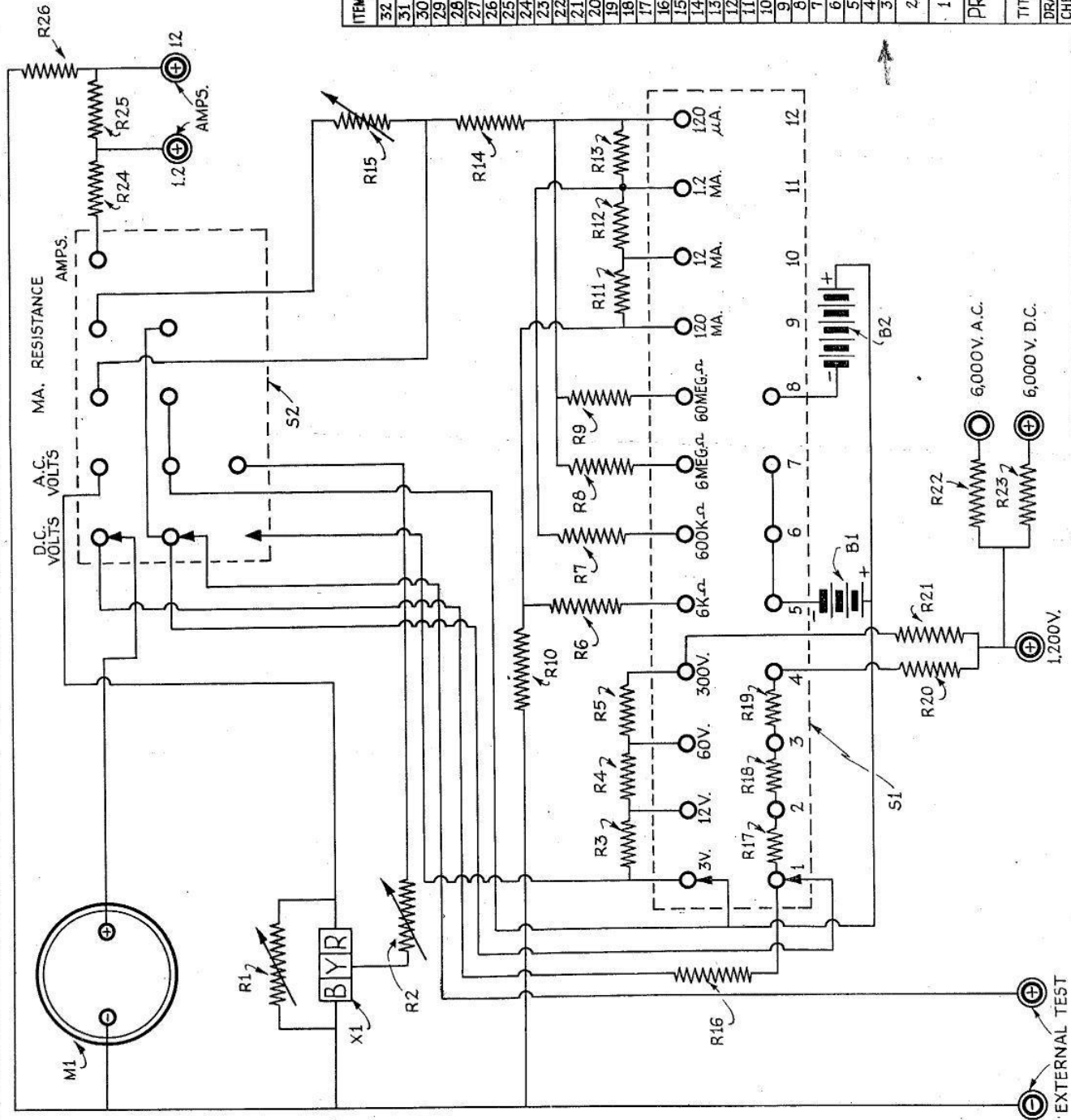
IMPORTANT NOTE RE HIGH VOLTAGE TELEVISION TESTS

Your Precision Series 85 High Sensitivity Multi-Range Test Set can safely and conveniently accommodate the full range of Television operating potentials up to and including 60,000 volts.*

(*) For a 30,000 volt range use the Precision Series TV-2 High Voltage Television Test Probe, complete with multiplier cartridge.

(*) For a 60,000 volt range use Series TV High Voltage Television Test Probe with 1080 Meg. Type TVM cartridge. .

This modern and essential accessory is available from your Precision distributor at moderate cost, and is fully described in the Precision catalog.



ITEM NO.	PART NO.	SPECIFICATION
32	X1	METER RECTIFIER
31	S2	POSITION FUNCTION SELECTOR
30	S1	12 POSITION RANGE SELECTOR
29	R26	0.014 Ω
28	R25	0.126 Ω
27	R24	168.4 Ω
26	R23	96 MEG. Ω
25	R22	4.8 MEG. Ω
24	R21	900K Ω
23	R20	18 MEG. Ω
22	R19	4.8 MEG. Ω
21	R18	960K Ω
20	R17	180K Ω
19	R16	56,800 Ω
18	R15	2,800 Ω OHMS ZERO ADJUST
17	R14	8K Ω
16	R13	7,200 Ω
15	R12	720 Ω
14	R11	72 Ω
13	R10	8 Ω
12	R9	345,100 Ω
11	R8	30,100 Ω
10	R7	2,732 Ω
9	R6	27 Ω
8	R5	240K Ω
7	R4	48K Ω
6	R3	9K Ω
5	R2	3K Ω SEALED CALIBRATED
4	R1	1K Ω SEALED CALIBRATED
3	M1	METER 50 μ AMPS. 3,200 Ω
2	B2	45 VOLTS TOTAL CONSISTING OF 1x15V. UNIT & 1x30V. UNIT
1	B1	4 1/2 VOLTS TOTAL CONSISTING OF 3x1 1/2V. CELLS

PRECISION APPARATUS CO. INC.
ELMHURST, L.I. N.Y.
TITLE: MULTI-RANGE TEST SET SCHEMATIC
SERIES 85
DRAWN BY: J. Kellack & DATE: 10-27-47
CHECKED BY: J. P. P. & DATE: 10-28-47

DECIBEL CHART

NEG.			POS.		NEG.			POS.	
Voltage Ratio	Power Ratio	-Db+	Voltage Ratio	Power Ratio	Voltage Ratio	Power Ratio	-DB+	Voltage Ratio	Power Ratio
1.0000	1.0000	0	1.000	1.000	.3162	.1000	10.0	3.162	10.000
.9772	.9550	.2	1.023	1.047	.3090	.09550	10.2	3.236	10.47
.9550	.9120	.4	1.047	1.096	.3020	.09120	10.4	3.311	10.96
.9333	.8710	.6	1.072	1.148	.2951	.08710	10.6	3.388	11.48
.9120	.8318	.8	1.096	1.202	.2884	.08318	10.8	3.467	12.02
.8913	.7943	1.0	1.122	1.259	.2818	.07943	11.0	3.548	12.59
.8710	.7586	1.2	1.148	1.318	.2754	.07586	11.2	3.631	13.18
.8511	.7244	1.4	1.175	1.380	.2692	.07244	11.4	3.715	13.80
.8318	.6918	1.6	1.202	1.445	.2630	.06918	11.6	3.802	14.45
.8128	.6607	1.8	1.230	1.514	.2570	.06607	11.8	3.890	15.14
.7943	.6310	2.0	1.259	1.585	.2512	.06310	12.0	3.981	15.85
.7762	.6026	2.2	1.288	1.660	.2455	.06026	12.2	4.074	16.60
.7586	.5754	2.4	1.318	1.738	.2399	.05754	12.4	4.169	17.38
.7413	.5495	2.6	1.349	1.820	.2344	.05495	12.6	4.266	18.20
.7244	.5248	2.8	1.380	1.905	.2291	.05248	12.8	4.365	19.05
.7079	.5012	3.0	1.413	1.995	.2239	.05012	13.0	4.467	19.95
.6918	.4786	3.2	1.445	2.089	.2188	.04786	13.2	4.571	20.89
.6761	.4571	3.4	1.479	2.188	.2138	.04571	13.4	4.677	21.88
.6607	.4365	3.6	1.514	2.291	.2089	.04365	13.6	4.786	22.91
.6457	.4169	3.8	1.549	2.399	.2042	.04169	13.8	4.898	23.99
.6310	.3981	4.0	1.585	2.512	.1995	.03981	14.0	5.012	25.12
.6166	.3802	4.2	1.622	2.630	.1950	.03802	14.2	5.129	26.30
.6026	.3631	4.4	1.660	2.754	.1905	.03631	14.4	5.248	27.54
.5888	.3467	4.6	1.698	2.884	.1862	.03467	14.6	5.370	28.84
.5754	.3311	4.8	1.738	3.020	.1820	.03311	14.8	5.495	30.20
.5623	.3162	5.0	1.778	3.162	.1778	.03162	15.0	5.623	31.62
.5495	.3020	5.2	1.820	3.311	.1738	.0320	15.2	5.754	33.11
.5370	.2884	5.4	1.862	3.467	.1698	.02884	15.4	5.888	34.67
.5248	.2754	5.6	1.905	3.631	.1660	.02754	15.6	6.026	36.31
.5129	.2630	5.8	1.950	3.802	.1622	.02630	15.8	6.166	38.02
.5012	.2512	6.0	1.995	3.981	.1585	.02512	16.0	6.310	39.81
.4898	.2399	6.2	2.042	4.169	.1549	.02399	16.2	6.457	41.69
.4786	.2291	6.4	2.089	4.365	.1514	.02291	16.4	6.607	43.65
.4677	.2188	6.6	2.138	4.571	.1479	.02188	16.6	6.761	45.71
.4571	.2089	6.8	2.188	4.786	.1445	.02089	16.8	6.918	47.86
.4467	.1995	7.0	2.239	5.012	.1413	.01995	17.0	7.079	50.12
.4365	.1905	7.2	2.291	5.248	.1380	.01905	17.2	7.244	52.48
.4266	.1820	7.4	2.344	5.495	.1349	.01820	17.4	7.413	54.95
.4169	.1738	7.6	2.399	5.754	.1318	.01738	17.6	7.586	57.54
.4074	.1660	7.8	2.455	6.026	.1288	.01660	17.8	7.762	60.26
.3981	.1585	8.0	2.512	6.310	.1259	.01585	18.0	7.943	63.10
.3890	.1514	8.2	2.570	6.607	.1230	.01514	18.2	8.128	66.07
.3802	.1445	8.4	2.630	6.918	.1202	.01445	18.4	8.318	69.18
.3715	.1380	8.6	2.692	7.244	.1175	.01380	18.6	8.511	72.44
.3631	.1318	8.8	2.754	7.586	.1148	.01318	18.8	8.710	75.86
.3548	.1259	9.0	2.818	7.943	.1122	.01259	19.0	8.913	79.43
.3467	.1202	9.2	2.884	8.318	.1096	.01202	19.2	9.120	83.18
.3388	.1148	9.4	2.951	8.710	.1072	.01148	19.4	9.333	87.10
.3311	.1096	9.6	3.020	9.120	.1047	.01096	19.6	9.550	91.20
.3236	.1047	9.8	3.090	9.550	.1023	.01047	19.8	9.772	95.50
					.1000	.01000	20.0	10.000	100.00

VOLTAGE RATIOS BEYOND THE RANGE OF THE TABLES.

- A. Ratios less than those in tables: Multiply ratio by 10 successively until the result can be found in the tables. From the decibel value found from the table subtract +20Db for each time the multiple of 10 was used.

Example:- Voltage Ratio of 0.02042 - find Db value:-

$$.02042 \times 10 \times 10 = 2.042 \text{ from the table:- Voltage ratio of } 2.042 = 6.2 \text{ Db}$$

$$6.2 \text{ Db} - 20 \text{ Db} - 20 \text{ Db} = -33.8 \text{ Db.}$$

- B. Ratios greater than those in tables: Divide ratio by 10 successively until the result can be found in the tables. To the Db value found from the table add +20Db for each time the divisor of 10 was used.

Example:- Voltage Ratio of 407.4 - find Db value:-

$$407.4 \div 10 \div 10 = 4.074 \text{ from the table:- Voltage ratio of } 4.074 = 12.2 \text{ Db}$$

$$12.2 \text{ Db} + 20 \text{ Db} + 20 \text{ Db} = 52.2 \text{ Db.}$$

PRECISION APPARATUS COMPANY, INC.

92-27 HORACE HARDING BLVD. • ELMHURST, NEW YORK

PRECISION APPARATUS COMPANY, INC.

92-27 HORACE HARDING BOULEVARD • ELMHURST, L. I., N. Y.

PRICE BULLETIN

Effective June 16, 1952

(Supersedes all previous price bulletins)

MODEL	DESCRIPTION	Shipping Weight	Net Price
J-L	Multi-range A.C. Ammeter — Open Lab. Portable	7 lbs.	\$27.75
J-P	Multi-range A.C. Ammeter — Closed Portable	8 lbs.	29.75
LC-1	Leather Carrying Case for Models 80 and 85	3 lbs.	9.50
LC-2	Leather Carrying Case for Model 40	2 lbs.	5.75
TVP	High Voltage Television Probe LESS multiplier cartridge	2 lbs.	12.35
TVP-A	Similar to TVP (above) except terminates in Amphenol MC-IF (or equal) screw-on type connector LESS multiplier cartridge	2 lbs.	12.35
TV-2	Model TVP WITH 30KV cartridge for Precision 20,000 ohms/volt test-sets	2 lbs.	14.75
TV-4	Model TVP-A WITH X100 cartridge for Series EV-10A and EV-20 VTVM's	2 lbs.	14.75
TV-4A	Same as TV-4 except furnished with special pin jack adapter for use with Precision EV-10, NOT EV-10A.	2 lbs.	14.75
TVM	Multiplier cartridges for TVP and TVP-A. See reverse side for list of instrument models versus resistance values and price schedule	8 oz.	—
EV-10A-MCP	Multi-range VTVM — 7" meter — Open Portable	17 lbs.	97.20
EV-10A-P	Same as above. — Closed Portable	18 lbs.	99.95
EV-10A-PM	Same as above. — Panel Mount	20 lbs.	102.70
RF-10A	High Frequency Vacuum Tube Probe for Series EV-10, EV-10A and EV-20	2 lbs.	14.40
EV-20	Compact, portable, Multi-range VTVM—4 $\frac{5}{8}$ " meter	11 lbs.	69.75
CR-30	Cathode Ray Tube Tester	22 lbs.	99.75
40	Compact 1000 ohms/volt AC-DC Multi-range Test Set	3 lbs.	26.95
80	Lab. style 1000 ohms/volt AC-DC Multi-range Test Set	5 lbs.	34.95
85	Lab. style 20,000 ohms/volt AC-DC Multi-range Test Set	5 lbs.	39.95
E-200C	Signal Generator — Open Portable	17 lbs.	73.25
E-200C-PM	Signal Generator — Panel Mount	20 lbs.	78.75
E-400	Sweep Signal Generator — Open Portable	24 lbs.	135.75
E-400-PM	Sweep Signal Generator — Panel Mount	25 lbs.	141.25
ES-500A	5" Cathode Ray Oscilloscope	44 lbs.	173.70
612MCP	Cathode Conductance Tube and Battery Tester — Open Portable	17 lbs.	72.75
612P	Same as above. — Closed Portable	19 lbs.	75.50
612PM	Same as above. — Panel Mount	20 lbs.	78.25
612C	Same as above. — Counter Case	23 lbs.	78.25
614	De-Luxe Cathode Conductance Tube and Battery Tester — 7" meter — Counter Case	27 lbs.	97.25
654MCP	Combination Cathode Conductance Tube and Circuit Tester — (20,000 ohms/volt) Open Portable	19 lbs.	107.00
654P	Same as above. — Closed Portable	20 lbs.	109.75
654PM	Same as above. — Panel Mount	20 lbs.	112.50
654C	Same as above. — Counter Case	23 lbs.	112.50
847L	"Multi-Master" 5000 ohms/volt AC-DC Multi-range Test Set — Open lab. portable	7 lbs.	51.25
847P	Same as above. — Closed Portable	8 lbs.	54.50
847-J	Industrial Circuit Tester — 847 plus A.C. Ampere ranges — Closed Portable	15 lbs.	84.25
858L	"Multi-Master" 20,000 ohms/volt AC-DC Multi-range Test Set — Open lab. portable	7 lbs.	58.75
858P	Same as above. — Closed Portable	8 lbs.	61.50
858-J	Industrial Circuit Tester — 858 plus A.C. Ampere ranges — Closed Portable	15 lbs.	91.25
866	De-Luxe "Multi-Master" — 9" meter — 5000 ohms/volt — Panel Mount	20 lbs.	78.00
10-12P	"Electronic" Tube and Battery Tester — Closed Portable	23 lbs.	104.50
10-12PM	Same as above. — Panel Mount	33 lbs.	109.25
10-12C	Same as above. — Counter Case	32 lbs.	109.25
10-15	De-Luxe "Electronic" Tube and Battery Tester — 9" meter — Upright Counter Case	45 lbs.	144.25
10-15PM	Same as above. — Panel Mount	37 lbs.	139.00
10-54P	Combination "Electronic" Tube and Circuit Tester — (20,000 ohms/volt). Closed Portable	25 lbs.	139.50
10-54PM	Same as above. — Panel Mount	35 lbs.	144.25
10-54C	Same as above. — Counter Case	34 lbs.	144.25
SSS Book	"Servicing by Signal Substitution"	8 oz.	.40

ALL PRICES ARE IN ACCORDANCE WITH O.P.S. REGULATIONS.

ALL PRICES SUBJECT TO CHANGE WITHOUT NOTICE

FORM SPB 6-52/25M

TVM CARTRIDGE MULTIPLIER VALUES

ORDERING INFORMATION: For utmost simplicity and convenience, multiplier cartridges should be designated by the type number TVM, followed by the resistance value in megohms; such as: TVM-1320.

For Use With VTVM D.C. VOLTAGE RANGES

NOTE: Probe model TVP-A is employed with each instrument listed below. However, where indicated, a phone jack plug adapter or pin jack adapter may also be required. In such cases, refer to the footnotes referenced under the column head "Adapter Required".

The TVM cartridges, listed below, each multiply the ranges of the respective instruments by a factor of 100. For example, if the basic original D.C. VTVM ranges are—

0-3-10-30-100-300 D.C. volts

then the recommended cartridge value will, when used in accordance with the operating instructions, provide the following x100 ranges:

0-300-1000-3000-10,000-30,000 D.C. volts.

IMPORTANT: In order to maintain the high safety factor built into each High Voltage Probe, DO NOT make measurements of voltages in excess of 60,000 volts D.C. (See instruction manual which accompanies every probe.)

Manufacturer	Model No.	TVM Resistance Value In Megohms	Adapter Required	Net Selling Price
Electronic Designs	100	1090	†	\$3.30
Electronic Instrument Co.	221	2490	†	4.10
Electronic Mfg. Co.	100-110	1090	—	3.30
Heath	V-1	1090	†	3.30
Hickok	125	892	*	4.10
"	203, 209	892	—	4.10
"	215	991	—	4.10
Jackson	645	1189	—	5.50
Precise Development	909	2490	—	4.10
PRECISION	EV-10	1320	*	2.75
"	EV-10A	1320	—	2.75
"	EV-20	1320	—	2.75
RCA	WV-65A	1090	—	3.30
"	WV-75A	1090	—	3.30
"	WV-77A	1090	—	3.30
"	WV-87A	1090	—	3.30
"	WV-95A	1090	—	3.30
"	WV-97A	1090	—	3.30
"	162-C	1090	†	3.30
"	165-A	1090	†	3.30
"	195-A	991	—	4.10
Radio City Products	662, 663	1585	†	5.50
"	664	1090	†	3.30
"	665, 668	1585	†	5.50
Reiner Electronics	451	1090	†	3.30
"	456	1585	†	5.50
Rider	20A	1585	†	5.50
Simpson	303	991	†	4.10
Supreme	562	1495	*	5.50
Sylvania	134-Z	1684	△	4.10
"	221-Z	1684	△	4.10

For Use With 20,000 ohm per volt MULTI-RANGE TESTERS

NOTE: The standard TVP probe is employed with each instrument listed below.

Manufacturer	Model No.	TVM Resistance Value In Megohms	To Give High Voltage Range of	With Instrument Set Up For	Net Selling Price
All 20,000 Ω/volt with a D.C. voltage range of 1000V. (such as) General Elec. Hickok Simpson Triplett Weston	YMW-1 605-A 250 277 2405-A 772, 779 785	480 980	25,000V. 50,000	1000V. 1000	\$2.75 4.10
All 20,000 Ω/volt with a D.C. voltage range of 1500V. (such as) PRECISION Roller-Smith	850 500	270 570 970	15,000V. 30,000 50,000	1500V. 1500 1500	5.50 5.50 5.50
All 20,000 Ω/volt with a D.C. voltage range of 2500V. (such as) Triplett	625-NA	450 950	25,000V. 50,000	2500V. 2500	4.10 5.50
All 20,000 Ω/volt with a D.C. voltage range of 5000V. (such as) Clough-Bren. Electronic Instr. Co. General Elec. Hickok " " " " " " PRECISION Radio City " " Simpson " " " " Supreme " " " "	220 555 565 UM-2 435 450 534 538 852 461 462 260 445 1005 567 584 640 644	400 900	25,000V. 50,000	5000V. 5000	3.30 4.10
All 20,000 Ω/volt with a D.C. voltage range of 6000V. (such as) PRECISION " " " " " " " " " " " " Radio City Triplett " "	85 654 854 856 858 954 10-54 488-A 630 630-A	480 1080	30,000V. 60,000	6000V. 6000	2.75 3.30
All 25,000 Ω/volt with a D.C. voltage range of 1000V.		225 1225	10,000V. 50,000	1000V. 1000	4.10 4.10
Simpson (Rotoranger)	221	594 900	Special Classification 30,000V. 50,000	300V. 5000	5.50 4.10

EXPLANATION OF "ADAPTER REQUIRED" REFERENCES

—	indicates no adapters are needed. Instrument uses a standardized screw-on type of panel connector which fits the Amphenol MC-1F (or equal) terminal of the TVP-A probe.
†	Requires use of Amphenol MC-1P (or equal) phone jack adapter plug available from distributors' stock at slight additional cost.
★	requires use of special, but simple pin plug adapter which provides for contact to standard .080" pin jacks. Available from "PRECISION" through same Parts Distributor from whom the High Voltage Probe is purchased.
△	requires same adapter as ★ above, except replace pin plugs with banana plugs.
‡	This instrument uses a special miniature screw-on connector which does not fit the standard Amphenol MC-1F type terminal of the TVP-A probe. Remove standard terminal of probe cable and replace with miniature connector which should be ordered from your Parts Distributor.